January 15, 2013

Michael R. Terry, Vice President
Sinclair Heights Board
13829 195th Dr SE
Monroe, WA 98272

RE: Eaglemont Subdivision AP2012-04
Response to SEPA Appeal
SDA Project Number 278-003

Dear Mr. Terry:

In response to the above referenced SEPA appeal regarding the above referenced project application, I have the following responses. I have included a summary of the SEPA Appeal comments/suggestions followed by my response.

- There was some existing concern regarding the water flow into the backyards and crawl spaces of the Sinclair Heights' homes on the North side of Rainier View Road. Specifically, "The heavy flow of South Snohomish County Convergence Zone precipitation has been routinely filling both Sinclair Heights detention ponds," resulting in water reaching the surrounding homes.

  The detention pond designed for the Eaglemont development has been designed using a continuous simulation hydrologic model maintained and updated by the State of Washington's Department of Ecology. This model designs ponds with a more realistic ability to retain precipitation. The Sinclair Heights detention ponds were designed using a hydrograph model. Redesigning the Sinclair Heights ponds using a continuous model would increase their size by about four times.

  In addition to using an updated pond analysis, we also propose to install a French drain south of the Eaglemont detention pond and west of the wetland across our parcel 'F' that will drain to the east into the wetland (Appendix E). This drain will intercept any seepage thru the proposed detention pond berm. This seepage will be minimal as the berm will be designed and built to be almost impervious. The French drain is offered as a final measure of protection.

- Concern has also been raised about the additional water which will flow into the Sinclair Heights wetlands. The specific concerns are:

  > "Where before development, a large portion of the precipitation was allowed to distribute over the site. Now that water in concentrated in the [Eaglemont] South Detention Pond…No analysis (based on data from Sinclair Heights detention ponds) of the capacity of the Sinclair Heights wetlands to percolate and pass the EO [Emergency Overflow] appears to have been conducted by SDA or by the City...The saturated Sinclair Heights wetlands tracts 998, 997, and 996 will back up into backyards and crawl spaces of homes that border the wetlands…"

  Analysis for the Emergency Overflow (EO) from the Eaglemont South Detention Pond through the Sinclair Heights has been completed. See Appendices A-C of this letter for hydrologic modeling and analysis outputs.

Exhibit E-1

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Analysis for the EO of the Eaglemont detention pond starts by modeling the precipitation runoff from the entire Eaglemont development (Appendix A). This runoff is then combined with corresponding Sinclair Heights' wetland tracts and analyzed using WWHM3 to calculate water flow in cubic feet per second (cfs). These calculated flows assume that all drainage structures within the Eaglemont detention pond fail. For the first culvert connecting Tract 998 to 997, the EO is 14.13 cfs. For the second culvert connecting Tract 997 to 996, the EO is 14.43 cfs. For the last culvert leaving Tract 996, the EO is 14.51 cfs (Appendix B).

Note that the outflow from the fully functional Eaglemont detention pond in a 100-year storm event is 2.19 cfs. Also note that for the pond to go into overflow, the sequence of events is highly unlikely. First the outflow pipe from the release structure must plug. This is an 18" plastic smooth walled pipe. This pipe is on the outlet side of an 18" diameter frop tee fitted with 3 orifices for release of the storms at the predetermined rates, all of which are compilations of actual rainfall data, which is how the continuous model works.

The EO flow is then used in the HY-8 culvert modeling software to test pipe capacity (Appendix C). The existing culvert between Tract 998 and 997 passes 14.13 cfs without any risk of overflowing. The remaining two culverts are not able to pass their corresponding flows in their existing state. It is suggested that these culverts entrances are modified to use a flared end section (Appendix D). This entrance will improve the pipes' inlet performance and will allow them to pass there corresponding EO flows of 14.43 cfs and 14.51 cfs.

While it is understood that the above analysis is a worse-case scenario, we still have added redundancy to our drainage system by including a bypass in the detention pond (Appendix E). This bypass will send all water over the Water Quality flow to a catch basin connected to Tract 997.

In response to your Emergency Overflow mitigation measures,

1) The project design will add a flow splitter to the outlet end of the pond release system. This will split the water quality flows (0.65 cfs) required to be treated by the biofiltration swale to the swale and level spreader and then into the wetland inTract 998. The remainder of the release from the pond will be routed in pipes and catch basins directly to the outlet pipe that flows east under 199th ave from Tract 998 to Tract 997. It is also worth noting that city code does not allow the diversion of stormwater from its natural drainage course. Thus your request to divert all flows from the wetland cannot be met. I should note that the 2, 10 and 100 year storms prior to the development (currently) are modeled as 1.20, 2.27, and 4.23 cfs (modeled as forested). The release rates out of the pond are 0.65, 1.17, and 2.20 cfs respectively. So if we split the water quality storm (0.65 cfs) to the wetland with all larger flows routed around tract 998, the reduction in stormwater to tract 998 and the backyards of the residences in question is clear.
2) The request to add emergency overflow pipes to the release from tracts 997 and from tracts 996 to allow for the passing of the emergency Overflow event has been covered above by the extensive modeling done by SDA. The requested overflow pipes will not be added as the existing pipes pass the EO flows. I should also note that the modeling of the emergency overflow flow rate from the pond is a very conservative approach, and with the entrance treatment done to these two pipes, they will pass the emergency overflow rates coupled with all other upstream flows to these wetlands and pipes.

If you have any questions or comments, do not hesitate to contact me at (425) 486-6533, ext. 111., or via email at areaves@sdaengineers.com.

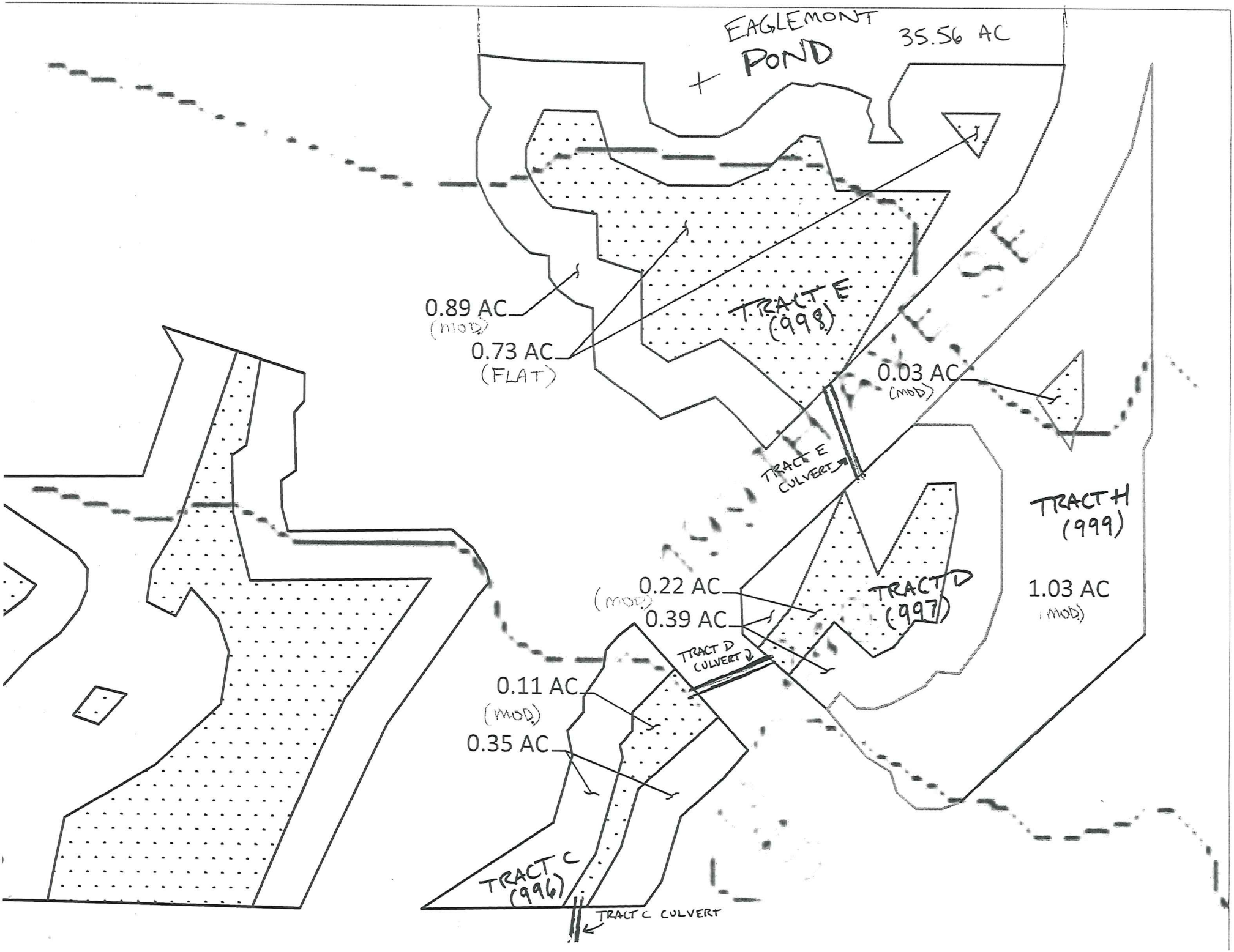
Sincerely,
SDA

Andrew C. Reaves, P.E.
Principal

Appendix A – Tract Area and Culvert Exhibit
Appendix B – Western Washington Hydrology Model and Flow Analysis
Appendix C – HY-8 Culvert Capacity Analysis
Appendix D – Culvert Flared End Section Detail
Appendix E – Updated Preliminary Road and Drainage Plan

Appendix A

Tract Area and Culvert Exhibit


EAGLEMONT POND
35.56 AC
0.89 AC (MOD)
0.73 AC (FLAT)
TRACT E (998)
0.03 AC (MOD)
TRACT E CULVERT
TRACT H (999)
1.03 AC (MOD)
0.22 AC (MOD)
0.39 AC
TRACT D (997)
TRACT D CULVERT
0.11 AC (MOD)
0.35 AC
TRACT C (996)
TRACT C CULVERT

Appendix B

Western Washington Hydrology Model and Flow Analysis

Western Washington Hydrology Model
PROJECT REPORT

Project Name: 278003 TRACT E pipe flow
Site Address:
City :
Report Date : 1/15/2013
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.20
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	36.56

Impervious Land Use	Acres

Element Flows To:
Surface Interflow Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	3.04
A B, Lawn, Mod	18.44

Impervious Land Use	Acres
ROADS MOD	5.13
ROOF TOPS FLAT	6.56
DRIVEWAYS MOD	1.25
POND	1.16

Name : tract 998
Bypass: No

GroundWater: No

Pervious Land Use	Acres
SAT, Pasture, Flat	.73
C, Pasture, Mod	.89

Impervious Land Use	Acres

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.200078
5 year	1.800779
10 year	2.276454
25 year	2.974131
50 year	3.569277
100 year	4.233606

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	5.683351
5 year	7.724162
10 year	9.160266
25 year	11.073442
50 year	12.5715
100 year	14.132973

Western Washington Hydrology Model
PROJECT REPORT

Project Name: 278003 TRACT D pipe flow
Site Address:
City :
Report Date : 1/15/2013
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.20
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	36.56

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	3.04
A B, Lawn, Mod	18.44

Impervious Land Use	Acres
ROADS MOD	5.13
ROOF TOPS FLAT	6.56
DRIVEWAYS MOD	1.25
POND	1.16

Name : tract 998
Bypass: No

GroundWater: No

Pervious Land Use	Acres
SAT, Pasture, Flat	.73
C, Pasture, Mod	2.31
SAT, Pasture, Mod	.25

Impervious Land Use	Acres

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.200078
5 year	1.800779
10 year	2.276454
25 year	2.974131
50 year	3.569277
100 year	4.233606

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	5.754904
5 year	7.843342
10 year	9.316092
25 year	11.281327
50 year	12.822349
100 year	14.43039

Western Washington Hydrology Model
PROJECT REPORT

Project Name: 278003 TRACT C pipe flow
Site Address:
City :
Report Date : 1/15/2013
Gage : Everett
Data Start : 1948/10/01
Data End : 1997/09/30
Precip Scale: 1.20
WWHM3 Version:

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	36.56

Impervious Land Use	Acres

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	Acres
C, Forest, Mod	3.04
A B, Lawn, Mod	18.44

Impervious Land Use	Acres
ROADS MOD	5.13
ROOF TOPS FLAT	6.56
DRIVEWAYS MOD	1.25
POND	1.16

Name : tract 998
Bypass: No

GroundWater: No

Pervious Land Use	Acres
SAT, Pasture, Flat	.73
C, Pasture, Mod	2.66
SAT, Pasture, Mod	.36

Impervious Land Use	Acres

MITIGATED LAND USE

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.200078
5 year	1.800779
10 year	2.276454
25 year	2.974131
50 year	3.569277
100 year	4.233606

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	5.776091
5 year	7.877799
10 year	9.360707
25 year	11.340321
50 year	12.89318
100 year	14.51403

Appendix C

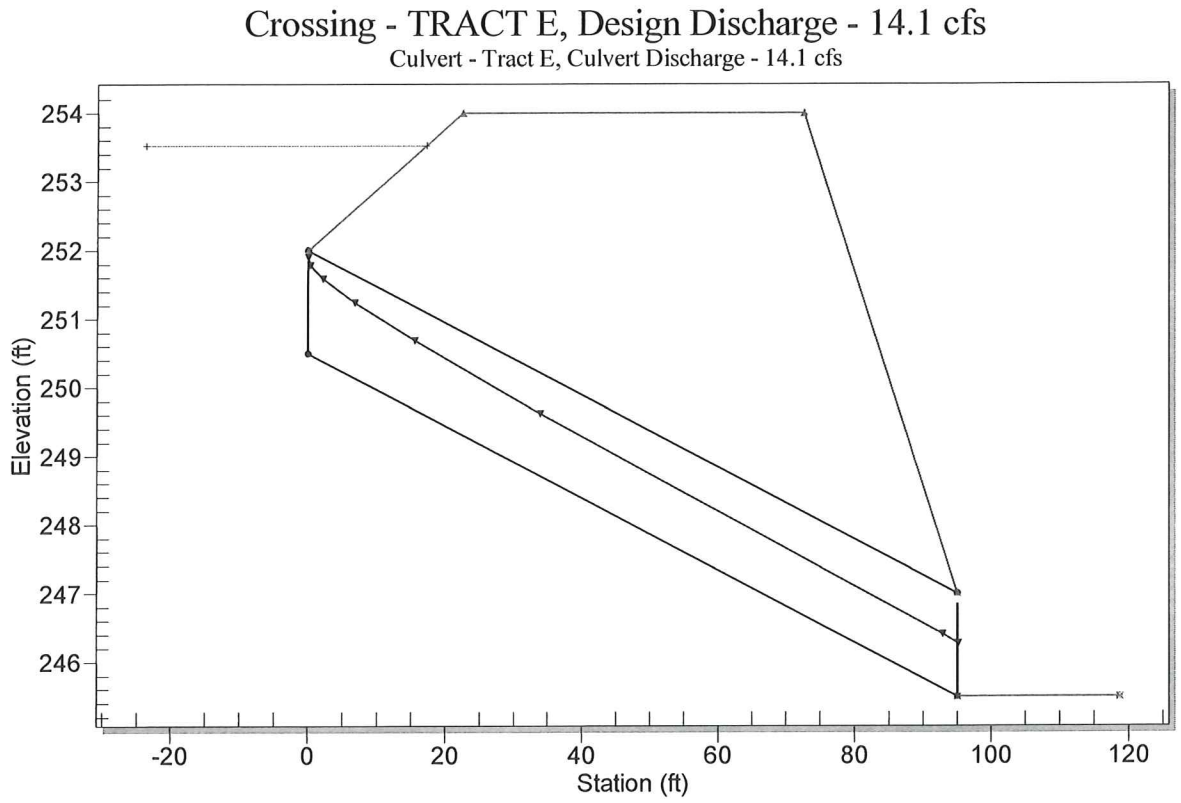
HY-8 Culvert Capacity Analysis

HY-8 Analysis Results

Crossing Summary Table

Culvert Crossing: TRACT E

Headwater Elevation (ft)	Total Discharge (cfs)	Tract E Discharge (cfs)	Roadway Discharge (cfs)	Iterations
251.71	5.00	5.00	0.00	1
251.85	6.00	6.00	0.00	1
251.99	7.00	7.00	0.00	1
252.15	8.00	8.00	0.00	1
252.32	9.00	9.00	0.00	1
252.51	10.00	10.00	0.00	1
252.72	11.00	11.00	0.00	1
252.95	12.00	12.00	0.00	1
253.21	13.00	13.00	0.00	1
253.49	14.00	14.00	0.00	1
253.52	14.13	14.13	0.00	1
254.00	15.67	15.67	0.00	Overtopping



Site Data - Tract E

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 250.50 ft

Outlet Station: 95.00 ft

Outlet Elevation: 245.50 ft

Number of Barrels: 1

Culvert Data Summary - Tract E

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

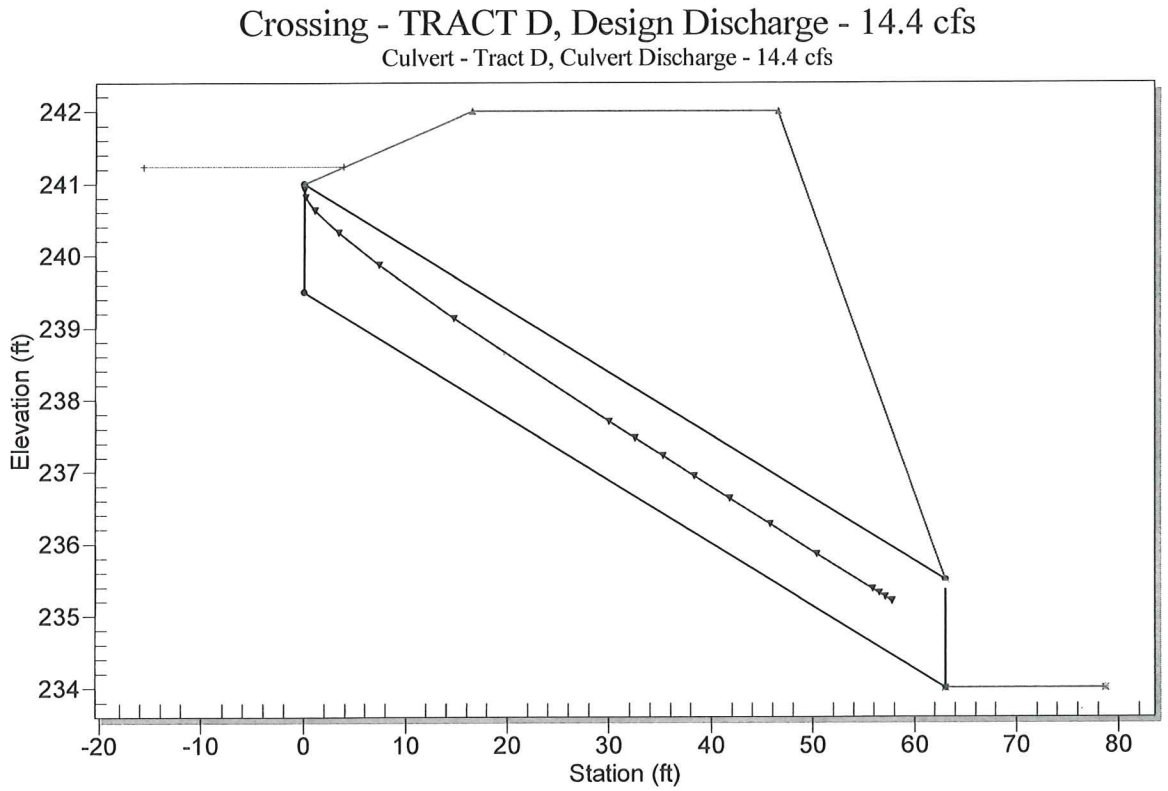
Inlet Edge Condition: Grooved End Projecting

Inlet Depression: NONE

Crossing Summary Table

Culvert Crossing: TRACT D

Headwater Elevation (ft)	Total Discharge (cfs)	Tract D Discharge (cfs)	Roadway Discharge (cfs)	Iterations
240.15	5.00	5.00	0.00	1
240.25	6.00	6.00	0.00	1
240.38	7.00	7.00	0.00	1
240.50	8.00	8.00	0.00	1
240.62	9.00	9.00	0.00	1
240.73	10.00	10.00	0.00	1
240.85	11.00	11.00	0.00	1
240.96	12.00	12.00	0.00	1
241.07	13.00	13.00	0.00	1
241.18	14.00	14.00	0.00	1
241.23	14.43	14.43	0.00	1
242.00	20.52	20.52	0.00	Overtopping



Site Data - Tract D

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 239.50 ft

Outlet Station: 63.00 ft

Outlet Elevation: 234.00 ft

Number of Barrels: 1

Culvert Data Summary - Tract D

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Side-Tapered, Rectangular

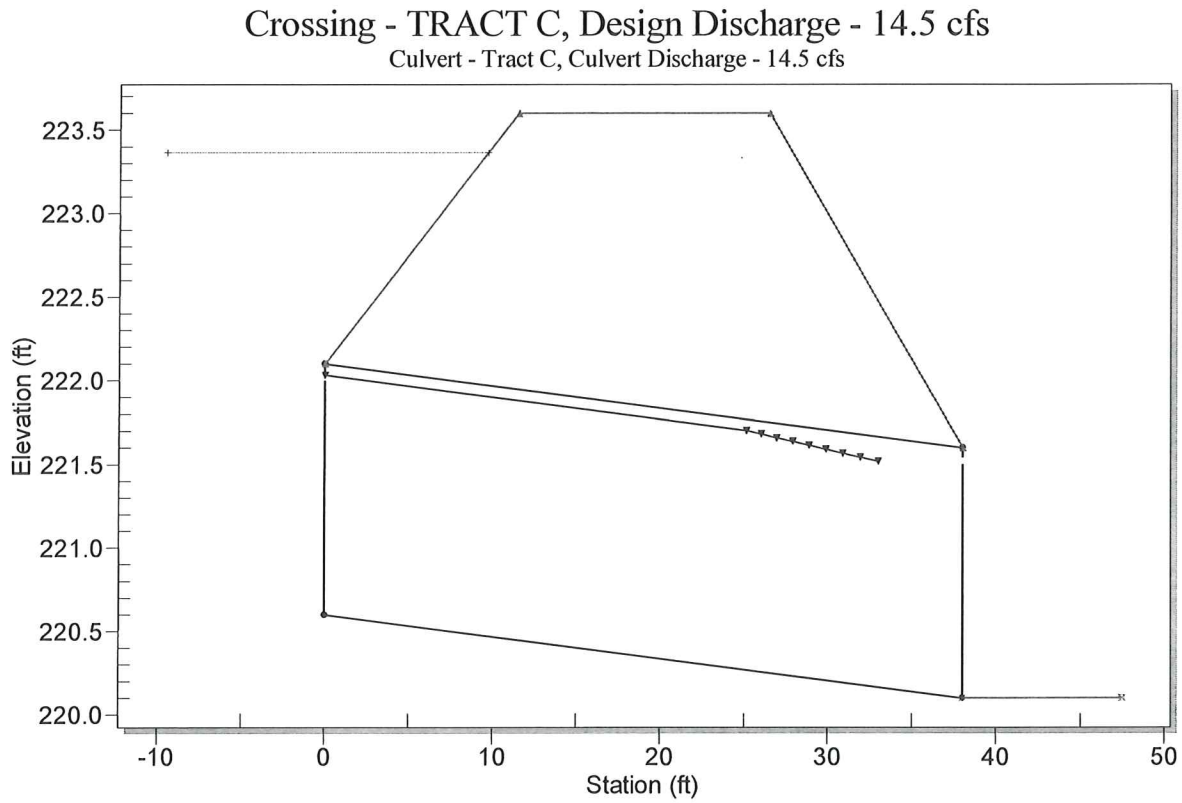
Inlet Edge Condition: Square Edge Top (26-90°) Wingwall

Inlet Depression: NONE

Crossing Summary Table

Culvert Crossing: TRACT C

Headwater Elevation (ft)	Total Discharge (cfs)	Tract C Discharge (cfs)	Roadway Discharge (cfs)	Iterations
221.58	5.00	5.00	0.00	1
221.72	6.00	6.00	0.00	1
221.85	7.00	7.00	0.00	1
221.97	8.00	8.00	0.00	1
222.09	9.00	9.00	0.00	1
222.20	10.00	10.00	0.00	1
222.32	11.00	11.00	0.00	1
222.43	12.00	12.00	0.00	1
222.54	13.00	13.00	0.00	1
223.22	14.00	14.00	0.00	1
223.37	14.51	14.51	0.00	1
223.60	15.36	15.36	0.00	Overtopping



Site Data - Tract C

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 220.60 ft

Outlet Station: 38.00 ft

Outlet Elevation: 220.10 ft

Number of Barrels: 1

Culvert Data Summary - Tract C

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Side-Tapered, Rectangular

Inlet Edge Condition: Beveled Edge Top (15-26°) Wingwall

Inlet Depression: NONE

Appendix D

Culvert Flared End Section Detail

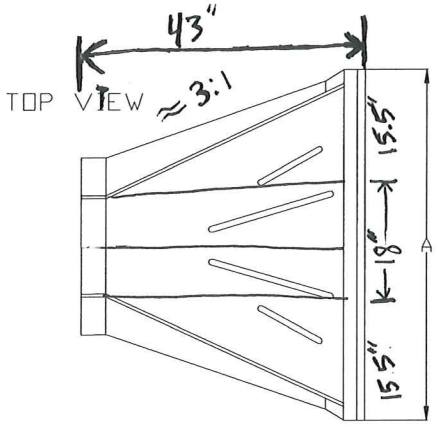
HANCOR HI-Q® FLARED END SECTION SPECIFICATIONS

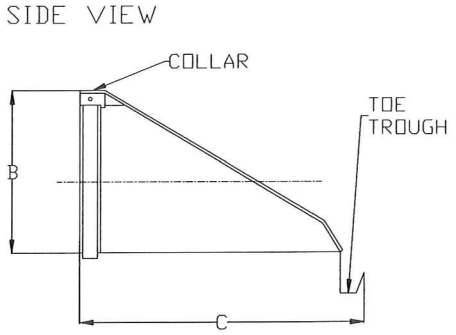
Scope
This specification describes 10- through 36-inch (250 to 900mm) Hi-Q Flared End Sections for use in culvert and drainage outlet applications.

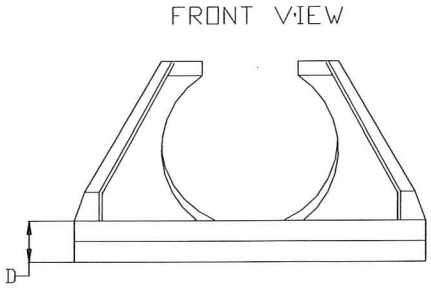
Requirements
The invert of the pipe and the end section shall be at the same elevation. Hi-Q Flared End Section shall be high density polyethylene meeting ASTM D3350 minimum cell classification 213320C. Each end section shall have a carbon black additive for UV protection. The metal threaded fastener shall be stainless steel.

Installation
Installation shall be in accordance with Hancor installation instructions and with those issued by state or local authorities.

PIPE DIAMETER, in (mm)							
Diameter	in (mm)	10/12 (250/300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)
A	in (mm)	42 (1066)	41 (1041)	49 (1244)	59.5 (1511)	88 (2235)	88 (2235)
B	in (mm)	14.5 (368)	19 (482)	22 (558)	28 (711)	36 (914)	43 (1092)
C	in (mm)	33 (838)	34 (863)	43 (1092)	48 (1219)	63.5 (1612)	66.5 (1689)
D	in (mm)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)	6 (152)







Appendix E

Updated Preliminary Road and Drainage Plan